REMARKS

A newly executed Declaration for the above-identified patent application has been submitted to replace the original filed declaration. In the Office Action, the Examiner objected to the declaration because the wording "[I] believe I am the original, first and joint inventor" is "inappropriate for a single inventor." (Office Action at 3). The newly executed Declaration corrects this informality.

Formal drawings have been concurrently filed. In the Office Action, the Examiner objected to the drawings because Figures 16 and 17 "were very blurry and difficult to see." (Office Action at 3). The enclosed formal drawings correct these informalities.

Claims 1-27 and 44 are pending in this application.

Claims 15 and 25 stand objected to because the term "telescopically collapsing" is unclear to the Examiner. (Office Action at 4). This objection is respectfully traversed as the quoted phrase has a clear meaning. The verb "telescope" is defined as "to slide or pass one within another like the cylindrical sections of a collapsible hand telescope." (Merriam-Webster's Collegiate Dictionary, Tenth Ed. 1998). The term "telescopic" is further defined as "having parts that telescope." (Id.) Accordingly, the adverb "telescopically" refers to parts that telescope, that is, parts that slide or pass one within another like the collapsible parts of a telescope.

Claims 1-9, 14-15, 17-20, 24-26 and 44 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Nishizawa et al. (U.S. Patent No. 5,275,184). The rejection is respectfully traversed.

The claimed invention relates to a method for reducing contaminants from the air/liquid interface in a wet etching bath. As such, amended independent claim 1 recites a method for "rapidly removing an upper portion of the semiconductor processing fluid" present in a processing bath. Similarly, amended independent claim 7 also recites a method for "reducing the contamination on a semiconductor wafer" by "rapidly removing an upper portion of said etching fluid from said wet etching bath to remove contaminants from the surface of said wet etching bath." Further, amended

dependent claim 8 states that, during the process, "a substantial portion of said etching fluid is removed." Such removal is accomplished in a variety of ways, for example, by "draining a top portion of said etching fluid," as recited in dependent claim 9, or by "hingedly releasing a door located at an upper portion of said wet etching bath," as recited in dependent claim 12. This way, "the surface tension and eddy current forces holding the contaminants at the air/liquid interface are cleaved and the contaminants flow into the outer weir where they may be collected." (Application at 10, lines 21-25).

Nishizawa et al. ("Nishizawa") does not disclose any of the limitations of the claimed invention. Nishizawa discloses an "apparatus for treating a wafer surface" (Col. 3, line 30) and "a system capable of rapidly substituting treatment solutions" (Col. 3, lines 19-20), but not a method for "rapidly removing an upper portion" of the etching fluid, as claims 1 and 7 recite. In fact, Nishizawa discloses a "uniform treatment solution flow container having an inlet and an outlet for a treatment solution . . . for containing a uniform flow of the treatment solution." (Col. 3, lines 32-35). According to Nishizawa, the "old treatment solution inside the container is rapidly displaced by the new treatment solution." (Col. 3, lines 54-55). Further, Nishizawa is silent about removal of contaminants from the air/liquid interface, and about all the ways of accomplishing such removal, as dependent claims 9-15 recite.

Similarly, amended independent claim 17 of the present invention recites the step of "rapidly removing a portion of (an) etching fluid from the upper surface of (an) etching vessels" as part of "[A] method for etching a semiconductor wafer." Amended independent claim 44 refers to a method of "reducing the contaminants on a silicon wafer during a wet etching process," which requires "immersing a wafer boat in an etching vessel" and then "rapidly removing said wafer boat . . . to remove contaminants residing on the upper surface of (an) etching fluid." Nishizawa discloses neither a method for "rapidly removing a portion of (an) etching fluid from the upper surface of (an) etching vessel," nor a method of etching by "rapidly removing (a) wafer boat" for the removal of contaminants. Accordingly, none of the limitations of the present invention are described in Nishizawa and, thus, the present invention is not anticipated under § 102(b).

Claims 10, 16 and 27 stand rejected under 35 U.S.C. § 103 (a) as being unpatentable over Nishizawa et al. (U.S. Patent No. 5,275,184) in view of Itoh et al. (U.S. Patent No. 5,795,401). The rejection is respectfully traversed.

The claimed invention relates to a method for reducing the contaminants in a wet etching bath by rapidly removing a substantial portion of the etching liquid from the bath. Rapidly removing of contaminants may be accomplished as claimed by opening a valve, hingedly releasing a door, sliding a door, and telescopically collapsing an etching bath, among others. Since the portion of the etching liquid flows out of the bath apparatus rapidly, the surface tension and the eddy current forces that hold the contaminants to be removed are cleaved. Subsequently, the contaminants flow into an outer weir where they are eventually collected.

Nishizawa relates to a dipping-type wafer treatment apparatus which allows for a good surface treatment of wafers, by employing a uniform rising flow of a treatment solution. For wafer surface treatment, Nishizawa teaches the use of two solutions, a first treatment bath substituted by a second and new treatment bath, supplied through two valves. (Col. 8, lines 24-29). Nishizawa is silent as to the removal of contaminants from the air/liquid interface by rapidly removing only an upper portion of the etching fluid, simply because Nishizawa does not contemplate the removal of surface contaminants, but rather the improvement of surface treatments for wafers. For this, Nishizawa does not remove the top portion of the etching fluid. Rather, Nishizawa substitutes completely an old treatment bath with a new one. Further, Nishizawa discloses "supplying a treatment solution at a constant velocity" to form the uniform rising flow (Abstract, lines 5-6), and not rapidly releasing a portion of the etching fluid, step which inherently requires an increasing velocity due to gravity forces.

To overcome the shortcoming of Nishizawa, the Office Action relies upon Itoh et al. ("Itoh"), which teaches the use of a pressure paddle to jet a pressure fluid to scrub a face of a substrate. (Col. 10, lines 55-57). In this respect, the Office Action concludes that "it would have been obvious . . . to have provided Nishizawa et al. reference with paddle as taught by Itoh et al. because the use of paddle would have

provided another method of removing contaminants from the top of the wafer etching bath." (Office Action at 10). Applicant disagrees.

The claimed invention would not have been obvious over Nishizawa in view of Itoh. First, Nishizawa is silent about the rapid removal of contaminants by opening a valve, hingedly releasing a door, sliding a door, or telescopically collapsing an etching bath. Second, even if Itoh recites using a paddle, Itoh does not refer to the removal of contaminants from the etching bath. Itoh merely refers to the scrubbing of a wafer surface using a rotary brush while pressure is applied by jetting a fluid on the other surface of the wafer. Third, Itoh does not teach or disclose rapidly removing of a substantial portion of the etching liquid. Itoh does not even mention an etching fluid. Itoh refers only to a wash liquid that is purified water and that comes into contact with a rotary brush that cleans the wafer surface. Thus, there is no teaching or suggestion in either of these two references for the claimed subject matter.

The references are also not combinable in view of the diverse areas involved in each reference. Nishizawa refers to wafer surface treatment by using at least two different solutions. Itoh, on the other hand, refers to the actual physical cleaning and scrubbing of the wafer surface by mechanical means such as a cylindrical rotary brush. It is clear, therefore, that the rejection is based on picking and choosing selected portions of each reference, without regard to the totality of teachings of the references, in an attempt to improperly use hindsight to reconstruct the invention. Accordingly, a person of ordinary skills in the art could not have been motivated to combine Nishizawa with Itoh, and withdrawal of this rejection is respectfully requested.

Claims 11 and 21 stand rejected under 35 U.S.C. § 103 (a) as being unpatentable over Nishizawa et al. (U.S. Patent No. 5,275,184) in view of Mohindra et al. (U.S. Patent No. 5,958,146). The rejection is respectfully traversed.

Mohindra et al. ("Mohindra") discloses a cleaning technique of a semiconductor wafer that uses a hot or heated liquid in conjunction with a carrier gas which includes a cleaning enhancement substance. Mohindra discloses, indeed, the use of control valves in the method of cleaning the semiconductor wafers, and the Office Action points out that "it would have been obvious to one ordinary skill in the art . . .

to have provided Nishizawa et al. reference with a valve as taught by Mohindra et al. because the use of valve would have provided another method of removing contaminants from the top of the wafer etching bath." (Office Action at 11). However, the control valves in Mohindra are not used for the rapid removal of contaminants from an upper portion of the etching fluid, as in the claimed invention. Rather, the control valves in Mohindra are used to allow a fluid to enter a filter bank, after the fluid was heated in a heater, and then into a wet processor. (Col. 5, lines 47-48; Col. 6, lines 29-35). Undoubtedly, the control valve in this reference merely "meters the carrier gas to the wet processor," and not a fluid, as the claimed invention discloses. Further, the control valve in Mohindra does not remove any portion of an etching fluid, and surely does not rapidly remove any contaminants, as it merely allows passage of a fluid from a filter bank into a processor. Accordingly, there is nothing in the combination of Nishizawa and Mohindra, without the improper use of hindsight reconstruction, to motivate a person of ordinary skills in the art to arrive at the claimed method.

Claims 12 and 22 stand rejected under 35 U.S.C. § 103 (a) as being unpatentable over Nishizawa et al. (U.S. Patent No. 5,275,184) in view of Woolderidge et al. (U.S. Patent No. 4,576,618). The rejection is respectfully traversed.

Woolderidge et al. ("Woolderidge") teaches a method for removing noxious vapors from a dirty gas stream. Woolderidge tangentially mentions the use of a cleaning door in the bottom of a housing for the periodical removal of a sludge that is formed at the bottom of such housing. (Col. 4, lines 2-5). The Office Action concedes that " [A]lthough the art is non-analogous to the claimed invention, it would have been an (sic) obvious that the liquid would have flown rapidly through the door." (Office Action at 12). The Office Action further points out that "it is common practice to attach a hinge to the door to provide easily opening and closing mechanism." (Office Action at 12). It is undoubtedly true that any liquid flows rapidly through an open door, as the Office Action asserts. It is also true that many doors are typically provided with hinges for movement facilitation. However, none of these findings are relevant to the claimed invention and the rejection of claims 12 and 22.

First, the sludge described by Woolderidge tends to settle at the bottom of the housing reservoir (Col. 4, 1-2; Fig. 1), and not on the top portion of the etching fluid as is removed in the claimed invention. Second, although the door disclosed by Woolderidge undoubtedly allows the particulates to pass, this is irrelevant since the claimed invention relates to a door that allows only an upper portion of the etching solution to rapidly flow out of the etching bath. It is the sudden release of the door, coupled with the gravitational forces and the predetermined height of the walls, that allow the surface tension and the eddy current forces to be cleaved and to subsequently allow the contaminants to flow out and be eventually collected. No mention of surface tension and/or current forces that are cleaved is made in Woolderidge. Thus, there is nothing in the combination of Nishizawa and Woolderidge, without the improper use of hindsight reconstruction, to motivate a person of ordinary skills in the art to arrive at the claimed method.

Claims 13 and 23 stand rejected under 35 U.S.C. § 103 (a) as being unpatentable over Nishizawa et al. (U.S. Patent No. 5,275,184) in view of Krieger et al. (U.S. Patent No. 4,576,618). Applicant respectfully notes that U.S. Patent No. 4,576,618 corresponds to Woolderidge and not Krieger and, accordingly, the comments made above with respect to the deficiencies of Woolderidge apply equally to claims 13 and 23. Applicant was unable to locate the Krieger et al. reference that the Office Action mentioned at page 12.

In view of the foregoing amendment and remarks, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue.

April 24, 2000

Respectfully submitted:

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